Systematic Reviews: Professional Malevolence or Important Process?

Smriti Saxena

ABSTRACT

A systematic review is intended to combine outcome data from published studies in a population. It is based on a number of steps and there are numerous advantages in conducting systematic reviews which dentists have been finding difficulties in performing them. These reviews are a key element of evidence-based health care, yet they remain in some ways mysterious. A review earns the adjective systematic if it is based on a clearly formulated question, identifies relevant studies, appraises their quality, and summarizes the evidence by use of definitive methodology. Taken into account the misconceptions and complications in conducting these kinds of studies, this article aims to guide readers for understanding, performing, and interpreting comprehensive systematic reviews in dental research.

Keywords: Dentistry, Methodology, Systematic review.

How to cite this article: Saxena S. Systematic Reviews: Professional Malevolence or Important Process? J Dent Sci Oral Rehab 2016;7(3):121-124.

Source of support: Nil
Conflict of interest: None

INTRODUCTION

Systematic reviews, as already reported in the opening article of this section, are the highest level of scientific evidence and may strengthen clinically useful evidence. It is a summary of the medical literature that uses explicit and reproducible methods to systematically search, critically appraise, and synthesize on a specific issue. According to evidence-based dentistry, clinically significant results found in clinical and laboratory researches will be incorporated in clinical practice, especially in dependence on conclusions drawn from systematic reviews.

For this reason, assessing articles and understanding their findings may be a valuable time saver for every clinician who wishes to introduce new conduct, technologies, or treatments into his/her clinical practice in a responsible and scientific manner. Therefore, reading a good systematic review would prevent clinicians from reading several original research articles (which may be gathered in the systematic review) with a view to reaching a clinical conclusion. However, it is critical for the clinician to read systematic reviews with a minimum comprehension of their structure and characteristics in order to interpret their findings in a reliable and clinically advantageous manner.

According to Gough et al, a systematic review is a research method, i.e., undertaken to review research literature, using systematic and rigorous methods. Systematic reviews are often referred to as “original empirical research” because they review primary data, which can be either quantitative or qualitative. Systematic reviews can be considered as the “gold standard” for reviewing the extant literature on a specific topic as it synthesizes the findings of previous research investigating the same or similar questions. This article is intended to provide an easy guide to understand the concept of systematic reviews which has been prepared with the aim of capacity building for dental practitioners and other primary health care professionals in research methodology and day-to-day clinical practice.

Systematic reviews and meta-analysis have become increasingly important in health care settings. Clinicians read them to keep up-to-date with their field and they are often used as a starting point for developing clinical practice guidelines. Granting agencies may require a systematic review to ensure there is justification for further research and some health care journals are moving in this direction.

There are also clear guidelines on how systematic reviews should be reported: The current guidelines, preferred reporting items for systematic reviews and meta-analyses (PRISMA) have replaced the quality of reporting of meta-analyses (QUORUM) statement. Regardless of the availability of these guidance documents, there is still a great deal of deterioration in the quality of systematic reviews; e.g., highlighted that only 19% of dental systematic reviews attempted to identify all relevant studies.

When undertaking a systematic review, it is important to search a range of databases to ensure that all potentially
relevant studies can be identified. The number of databases that needs to be searched will depend on the topic under review but for most dental reviews the use of MEDLINE, EMBASE, and the CENTRAL database of the Cochrane library seems to be a minimum requirement.

Ideally, additional contact with experts in the field together with the use of grey literature (material that is not formally published, such as institutional or technical reports, working papers, and conference proceedings) and not restricting results to English-language papers only will increase the potential to identify studies.5

The motive of this study is to introduce readers to:

• The terms used in systematic reviews and meta-analysis
• The two ways of evaluating all the available evidence on an issue, i.e., systematic reviews and meta-analysis
• Discuss the steps in doing a systematic review
• Interpret results of a meta-analysis
• The advantages and disadvantages of systematic review and meta-analysis
• Difference between a systematic review and a narrative review based on Cook et al.10

DEFINITIONS

The evidence-based practitioner, David Sackett, defines the following terminologies:

• **Review**: The general term for all attempts to synthesize the results and conclusions of two or more publications on a given topic.
• **Overview**: When a review strives to comprehensively identify and track down all the literature on a given topic (also called “systematic literature review”).4
• **Systematic review**: In a systematic review, the results from the individual studies are typically not combined into a single summary measure of effect, but may be presented in Table 1 or narrative format. A systematic review is defined as “a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies” (Cochrane Collaboration 2005).6
• **Meta-analysis**: A specific statistical strategy for assembling the results of several studies into a single estimate. A meta-analysis is a particular type of systematic review in which the measures of effect from individual studies are combined into a single overall measure that synthesizes the findings from the studies identified. Meta-analysis is particularly well suited to combine data from randomized controlled trials (RCTs) and the Cochrane Collaboration which has specialization in this.

**STEPS OF THE SYSTEMATIC REVIEW**

Researchers differ on the number of steps taken when conducting a systematic review. However, the sequence of the steps is similar. The steps of systematic review are structured and well-defined and various frameworks, for instance the Cochrane Collaboration, Joanna Briggs Institute, can be used to guide the systematic review process.5,6 The five steps of the systematic review are discussed below:

1. **Review question**: The questions that are to guide the systematic review must be answerable and searchable and therefore should include the following variables:
   - **P** stands for Population of researcher’s interest
     - For example – For which group do you need information? – Answer is school children
   - **I** stands for Intervention or Exposure – For example
     - What medical intervention do you need to study?
     - Answer is fluoride therapy
   - **C** stands for Comparative Interventions – For example
     - What is the evidence that the proposed intervention produces better or worse results than no intervention, or a different type of intervention? – Answer is influence on the remineralization process
   - **O** stands for Outcomes of interest (The Cochrane Collaboration 2005) – For example – What is the effect of the intervention? – Answer is caries reduction. This is collectively known as PICO format. Alternatively, PICOT (to assess effect and time-frame) and PICOC (to assess the context) can be used (The Cochrane Collaboration 2005).

In order to provide the valid and reliable results for a research, the PICO, PICOT, or PICOC methods are used to specify the right questions and thus help in validation of results. Depending on the goals of the review, the
Systematic Reviews: Professional Malevolence or Important Process?

reviewer can either choose the PICO, PICOT, or PICOC format. The problems to be addressed by the review should be specified in the form of clear, unambiguous, and structured questions before beginning the review work. Once the review questions have been set, modifications to the protocol should be allowed only if alternative ways of defining the populations, interventions, outcomes, or study designs become apparent.

2. **Searching the literature**: This step involves the formulation of a search strategy, which includes inclusion and exclusion criteria, keywords, source of evidence, the documentation of the search, and selection of the research reports. The search for studies should be extensive. Multiple resources (both computerized and printed) should be searched without language restrictions. The study selection criteria should flow directly from the review questions and be specified a priori. Reasons for inclusion and exclusion criteria should be recorded.

3. **Critical appraisal**: The steps undertaken in estimating the study quality are early definition of study quality and criteria, setting up a good scoring system, developing a standard form for assessment, calculating quality for each study, and finally using this for sensitivity analysis. For example, the quality of a RCT can be assessed by finding out the answers to the following questions:
   - Was the assignment to the treatment groups really random?
   - Was the treatment allocation concealed?
   -Were the groups similar at baseline in terms of prognostic factors?
   - Were the eligibility criteria specified?
   - Were the assessors, the care provider, and the patients blinded?
   - Were the point estimates and measure of variability presented for the primary outcome measures?
   -Did the analysis included intention-to-treat analysis?

Study quality assessment is relevant to every step of a review. A variety of critical appraisal instruments could be used to appraise the studies in a systematic review. However, a disadvantage of critical appraisal instruments is that there is not one single tool that can be fully applied to all studies. Tools that could be used for different types of studies include the following: Assessing the methodological quality of systematic reviews (AMSTAR) tool for the “assessment of multiple systematic reviews,” the evaluation tool for quantitative research studies, and the meta-analysis of statistics assessment and review instrument (MAStARI) critical appraisal tools for RCT or pseudorandomized trial.

4. **Data extraction**: Data extraction is the process by which researchers obtain the necessary information about study findings from the included studies. It is the step in which all relevant findings meeting the selection criteria are aggregated to form the body of evidence regarding the research questions posed. Various data extraction tools, for instance, the Joanna Briggs Institute tools, are available to perform the data extraction.

5. **Data synthesis**: Data synthesis is the stage in the review process when studies meeting inclusion criteria are summarized to form the outcome of the systematic review. The aims of the data synthesis are to aggregate study number of previously conducted studies that have met a rigorous set of selection criteria is “collected” and analyzed with reference to the specified research questions posed by the student researcher.

**META-ANALYSIS**

A meta-analysis is the combination of data from several independent primary studies that address the same question to produce a single estimate like the effect of treatment or risk factor. The term meta-analysis has been used to denote the full range of quantitative methods for research reviews. Meta-analysis provides a logical framework to a research review where similar measures from comparable studies are listed systematically and the available effect measures are combined wherever possible. It reduces the quantity of data by summarizing data from multiple resources and helps to plan research as well as to frame guidelines. It also helps to make efficient use of existing data, ensuring generalizability, helping to check consistency of relationships, explaining data inconsistency, and quantifies the data. It helps to improve the precision in estimating the risk by using explicit methods.

Therefore, “systematic review” will refer to the entire process of collecting, reviewing, and presenting all available evidence, while the term “meta-analysis” will refer to the statistical technique involved in extracting and combining data to produce a summary result.

**INTERPRET RESULTS**

The results of a meta-analysis are usually presented as a graph called forest plot because the typical forest plots appear as forest of lines. It provides a simple visual presentation of individual studies that went into the meta-analysis at a glance. It shows the variation between the studies and an estimate of the overall result of all the studies together.
When examining the results of a systematic reviews/meta-analysis, the following questions should be kept in mind:

- Were apples combined with oranges?
  - Heterogeneity among studies may make any pooled estimate meaningless.
- Were all of the apples rotten?
  - The quality of a meta-analysis cannot be any better than the quality of the studies it is summarizing.
- Were some apples left on the tree?
  - An incomplete search of the literature can bias the findings of a meta-analysis.
- Did the pile of apples amount to more than just a hill of beans?
  - Make sure that the meta-analysis quantifies the size of the effect in units that you can understand.

**ADVANTAGES OF SYSTEMATIC REVIEWS**

Systematic reviews have specific advantages because of using explicit methods which limit bias, draw reliable and accurate conclusions, easily deliver required information to health care providers, researchers, and policymakers, help to reduce the time delay in the research discoveries to implementation, improve the generalizability and consistency of results, generation of new hypotheses about subgroups of the study population, and overall they increase precision of the results.8

**LIMITATIONS/DISADVANTAGES IN SYSTEMATIC REVIEWS/META-ANALYSIS**

As with all research, the value of a systematic review depends on what was done, what was found, and the clarity of reporting. As with other publications, the reporting quality of systematic reviews varies, limiting readers’ ability to assess the strengths and weaknesses of those reviews. Even though systematic review and meta-analysis are considered the best evidence for getting a definitive answer to a research question, there are certain inherent flaws associated with it, such as the location and selection of studies, heterogeneity, loss of information on important outcomes, inappropriate subgroup analyses, conflict with new experimental data, and duplication of publication.9

An important issue to be discussed in this article is the distinction between a systematic review and a narrative review. This could be done according to a set of simple criteria formulated by Cook et al. However, most problems encountered by users of secondary studies are associated with meta-analyses.

**CONCLUSION**

Systematic reviews can be very useful decision-making tools for primary care/family physicians. They objectively summarize large amounts of information, identifying beneficial or harmful interventions, which will be useful for clinicians, researchers, and even for public and policymakers. Since meta-analysis is based on statistical data, they have greater scientific evidence power than a systematic review alone. According to Feldstein, systematic reviews will continue to play a major role in translating research evidence into patient care decisions, directing the clinical practice based on scientific evidence and indicating new research themes, thereby contributing to science growth in response to health care.

**REFERENCES**

1. Proffit WR. Evidence and clinical decisions: asking the right questions to obtain clinically useful answers. Semin Orthod 2013 Sep;19(3).